

299-E17-05 (A4739) Log Data Report

Borehole Information:

Borehole: 299-E17-05 (A4739)		Site: 216-A-36B Crib			
Coordinates (WA St Plane)		GWL (ft)¹: 321.70	GWL Date: 05/05/03		
North 135278.548 m	East 575093.967 m	Drill Date 07/65	TOC² Elevation 722.34 (NAVD88)	Total Depth (ft) 335.0	Type cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	1.75	4.5	4.0	0.25	0	293
Steel (welded)	1.3	8.625	*8.0	0.3125	0	355

The logging engineer measured the casing stickup from ground surface using a steel tape. A caliper was used to determine the outside 4-in. casing diameter. The caliper and inside casing diameter were measured using a steel tape; both measurements were rounded to the nearest 1/16 in. Casing thickness was calculated. *An accurate inside diameter and casing thickness measurement was not possible because the 8-in. casing at the surface is distorted from the installation of the 4-in. casing and grouted to the top. Bottom casing depth is from Ledgerwood (1993).

Borehole Notes:

The casing depth information provided above is derived from field measurements and a well construction and completion summary obtained from Ledgerwood (1993), corrected to the current TOC. The approximate casing size information for the 4-in. and 8-in. steel casings was confirmed from tape and caliper measurements collected in the field by Stoller personnel. The groundwater level was measured from the TOC by Stoller personnel. The coordinates and TOC elevation are derived from HWIS³.

This borehole was originally drilled in 1965. Remediation of the borehole was conducted in 1979. A cement plug was emplaced in the bottom of the borehole between 330 and 336 ft. The 8-in. casing was perforated between 0 and 288 ft. A packer was set at 293 ft and a 4-in. liner placed to the packer. A sand plug was placed between 290 and 293 ft. Cement grout was placed in the annulus between the 4-in. and 8-in. casings from 290 ft to the top of the borehole.

Logging Equipment Information:

Logging System: Gamma 1G	Type: SGLS (35%)
Calibration Date: 04/03	Calibration Reference: GJO-2003-438-TAR
	Logging Procedure: MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5 Repeat
Date	04/28/03	04/29/03	05/05/03	05/06/03	05/06/03
Logging Engineer	Kos	Kos	Kos	Kos	Kos
Start Depth (ft)	70.0	140.0	250.0	335.0	325.0
Finish Depth (ft)	2.0	69.0	139.0	291.0	291.0
Count Time (sec)	200	200	200	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	n/a ⁴	n/a	n/a	n/a	n/a
Pre-Verification	AG003CAB	AG004CAB	AG005CAB	AG006CAB	AG006CAB
Start File	AG003000	AG004000	AG005000	AG006000	AG006045
Finish File	AG003068	AG004071	AG005111	AG006044	AG006079
Post-Verification	AG003CAA	AG004CAA	AG005CAA	AG006CAA	AG006CAA

Log Run	6				
Date	05/06/03				
Logging Engineer	Kos				
Start Depth (ft)	292.0				
Finish Depth (ft)	249.0				
Count Time (sec)	200				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	1.0				
ft/min	n/a				
Pre-Verification	AG006CAB				
Start File	AG006080				
Finish File	AG006123				
Post-Verification	AG006CAA				

Logging Operation Notes:

Spectral gamma logging was performed in this borehole during April and May 2003 on four separate days. Logging was conducted without a centralizer on the sonde because the borehole diameter was too small. Logging measurements are referenced to the top of the 4-in. casing. A repeat section was collected in this borehole to evaluate system performance.

Analysis Notes:

Analyst:	Henwood	Date:	05/22/03	Reference:	GJO-HGLP 1.6.3, Rev. 0
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Pre-run and post-run verifications of the logging system were performed for each day's log event. The acceptance criteria were met.

Casing corrections for 0.3125-in.- and 0.25-in.-thick casings were applied for the 8-in. and 4-in. steel casings, respectively. Where more than one casing exists at a depth the casing correction is additive (e.g., an 8-in. and 4-in. casing would be the correction for $0.3125 + 0.25 = 0.5625$).

Data were acquired for 100 seconds at 1.0-ft depth intervals during log runs 4 and 5 between 291 and 335 ft in depth rather than 200 seconds at 1.0-ft intervals in the remainder of the borehole. This change was made where a single casing was presumed to exist in the borehole rather than dual casings and grout reported to exist in the upper portion of the borehole that required longer counting times. Measurements for the gamma rays (e.g., 662-keV ¹³⁷Cs, 1333-keV for ⁶⁰Co, 1460-keV for ⁴⁰K, and 2614-keV for ²³²Th) appear to

be adequate at the 100-s counting time. However, the naturally occurring ^{238}U as measured with either the 609-keV or 1764-keV gamma rays was not detected above the MDL at some depth locations. This lack of detection is probably the result of the selection of an insufficient counting time based on an inaccurate or misleading borehole completion record that indicated a single casing with no completion materials.

Each spectrum collected during a log run was processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G1May03.xls using an efficiency function and corrections for casing, water, and dead time as determined from annual calibrations. Dead time corrections are applied where dead times exceed 10.5 percent; dead time did not exceed this value in this borehole. A correction for water was applied to the data below 322 ft in depth.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclides (^{137}Cs and ^{60}Co) detected in the borehole, naturally occurring radionuclides (^{40}K , ^{238}U , ^{232}Th [KUT]), a combination of man-made, KUT, and dead time, and total gamma plotted with dead time. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, casing corrections, or water corrections. Repeat log sections for naturally occurring radionuclides are also included.

In addition, total gamma log plots acquired in 1965, 1968, 1970, and 1976 are included to assess the gamma profile during the time period the nearby crib was in operation from 1966 to 1972.

Results and Interpretations:

^{137}Cs and ^{60}Co were the man-made radionuclides detected in this borehole. ^{137}Cs was detected between 30 and 63 ft in depth. ^{137}Cs was also detected at sporadic locations throughout the borehole near its MDL of approximately 0.2 pCi/g. The maximum concentration was approximately 235 pCi/g at 37 ft.

^{60}Co was detected between 92 and 102 ft in depth. The maximum concentration measured was approximately 0.3 pCi/g. ^{60}Co was also detected at sporadic locations near its MDL of approximately 0.1 pCi/g.

The KUT log profiles are essentially featureless. The dual casings and grout result in significant gamma attenuation. Completion materials, if any, placed in the borehole below 290 ft may affect interpretation.

The historical total gamma logs indicate gamma activity between 23 and 69 ft between 1965 and 1968. This activity increased significantly between 1968 and 1972, and continued to increase at a slow rate between 1972 and 1976. This depth interval coincides with ^{137}Cs detected by the SGLS between 30 and 63 ft. Gamma activity between 69 and 101 ft followed a similar pattern over time. ^{60}Co was detected by the SGLS between 92 and 102 ft depth in 2003. Gamma activity below 305 ft was present before 1965 and had decreased to near background levels by 1976.

The repeat section indicated good agreement of the man-made radionuclides and the naturally occurring KUT.

References:

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Inc., Richland, Washington.

¹ GWL – groundwater level

² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ N/A – not applicable

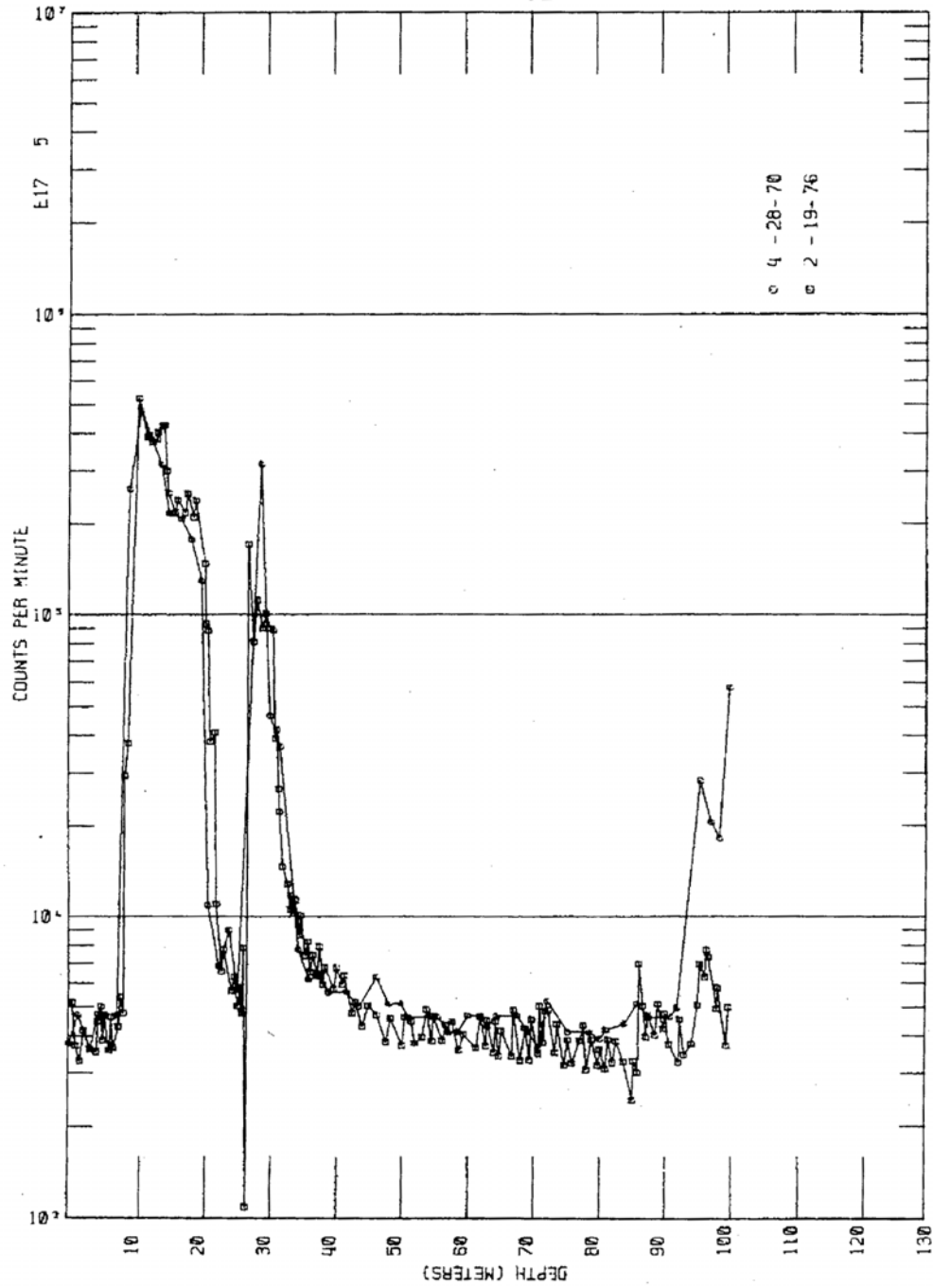


FIGURE A-49 (Continued)
WELL E17-5 SCINTILLATION PROBE PROFILES

from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-E17-5, Logged on 4/28/70 and 2/19/76

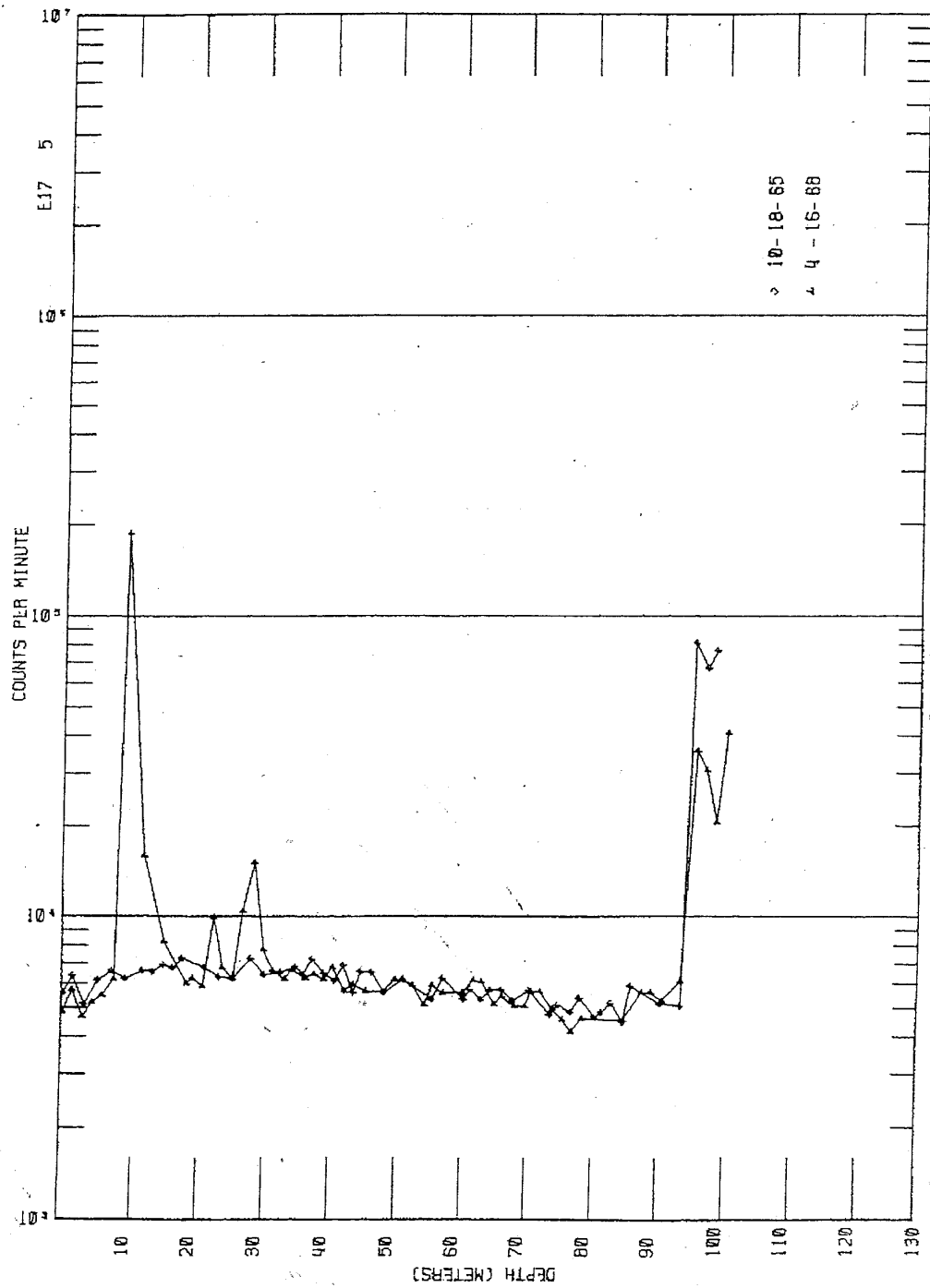


FIGURE A-49

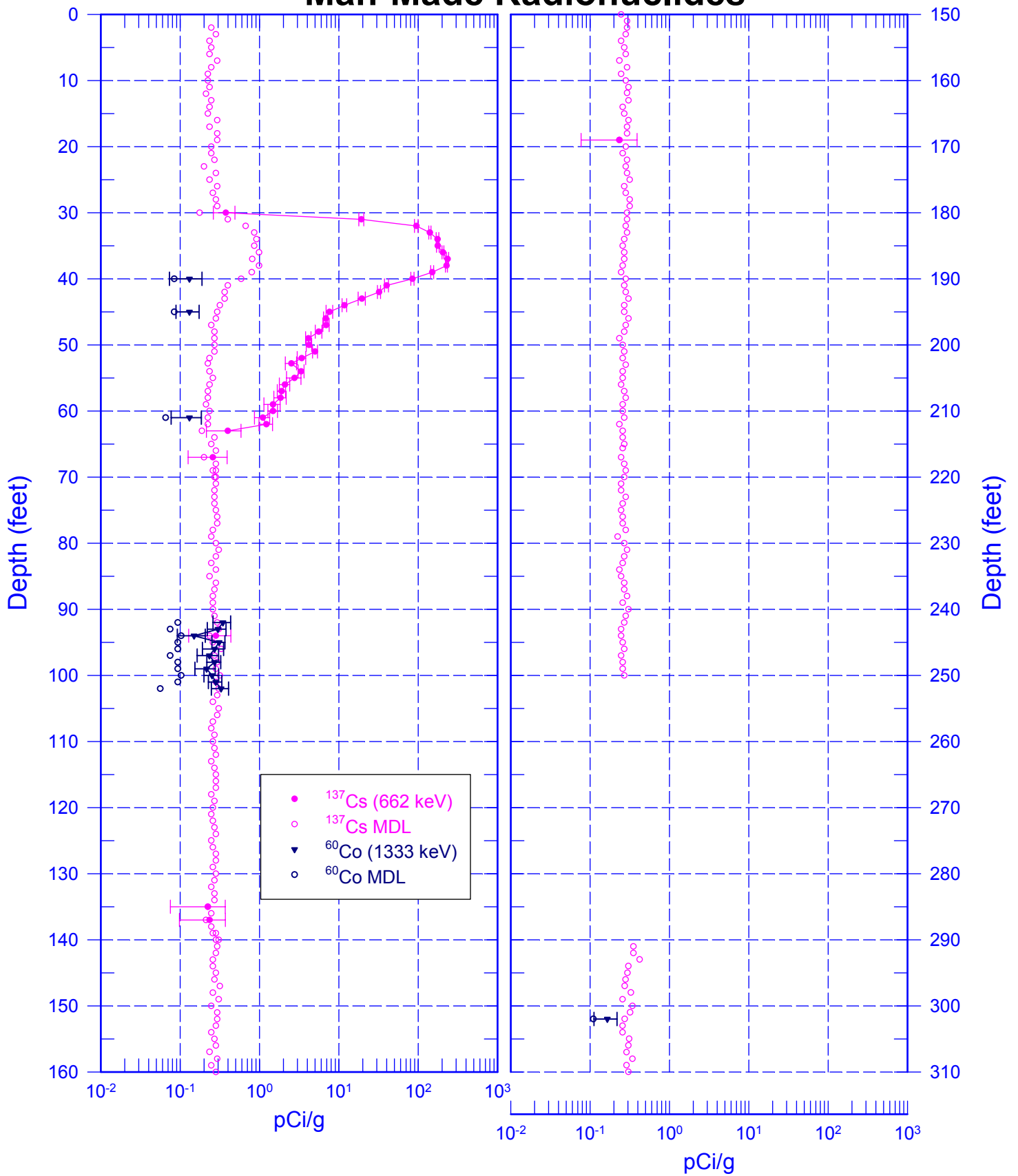
WELL E17-5 SCINTILLATION PROBE PROFILES

from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-E17-5, Logged on 10/18/65 and 4/16/68

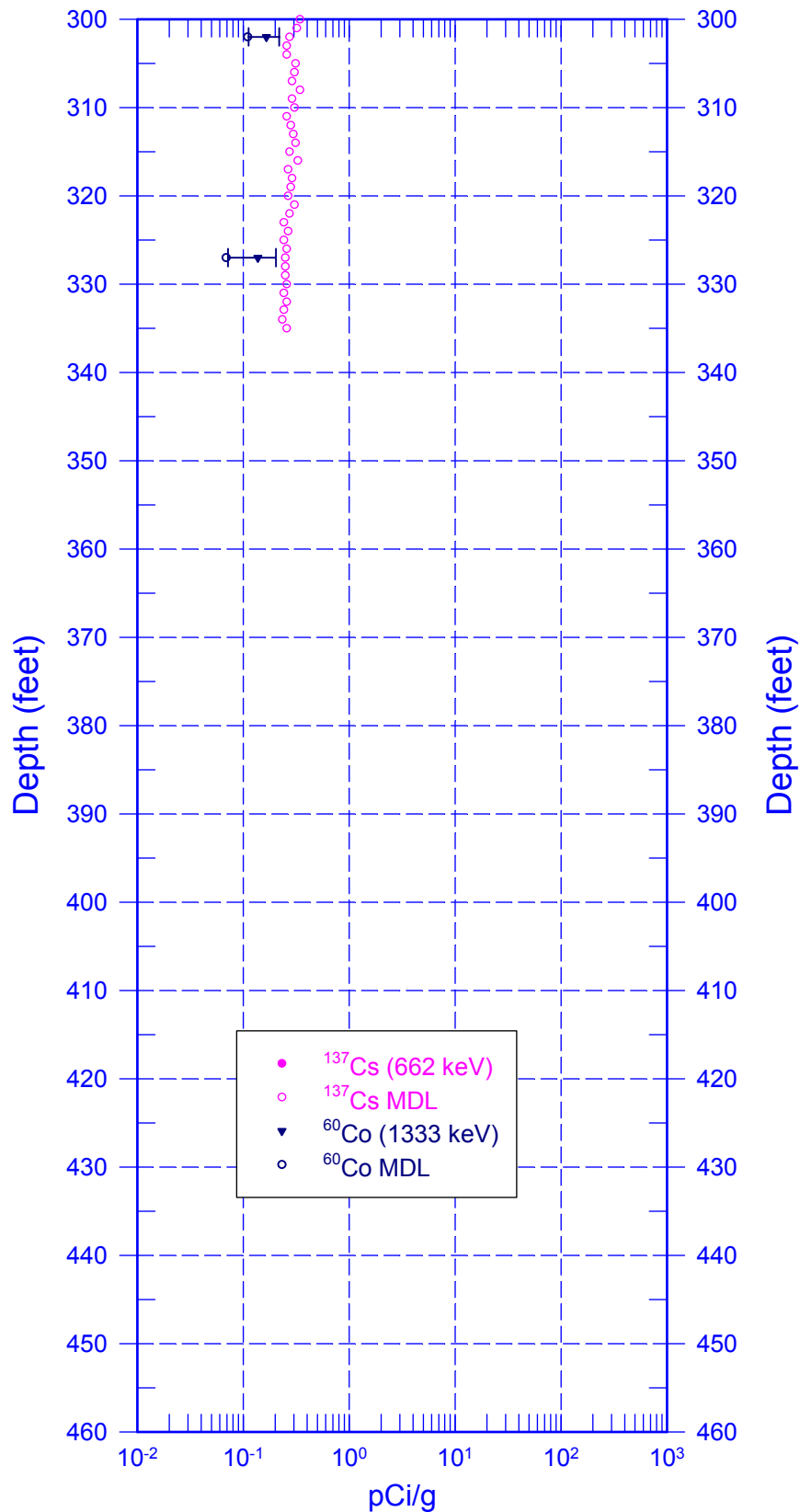
299-E17-05 (A4739)

Man-Made Radionuclides



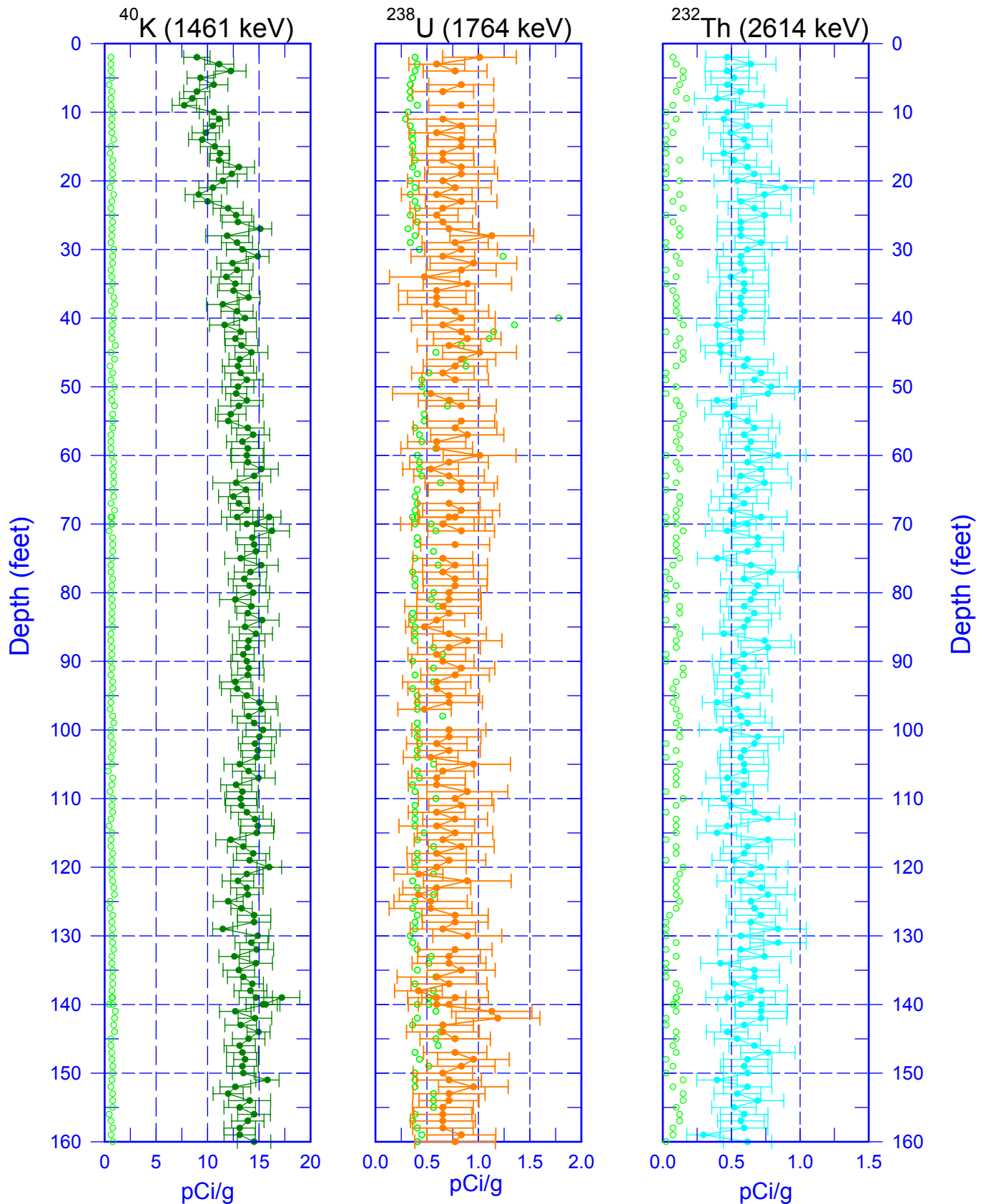
299-E17-05 (A4739)

Man-Made Radionuclides



299-E17-05 (A4739)

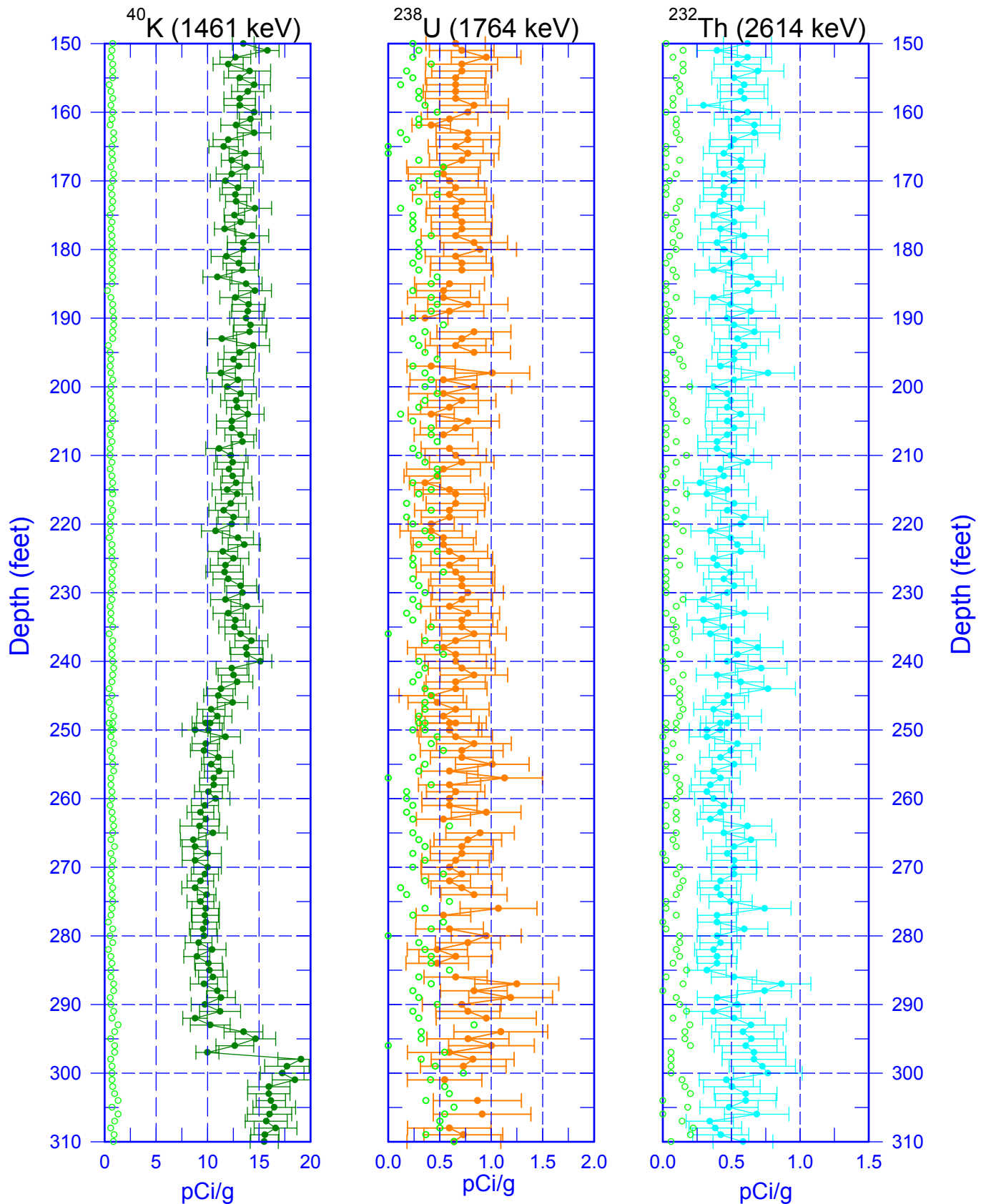
Natural Gamma Logs



○ MDL

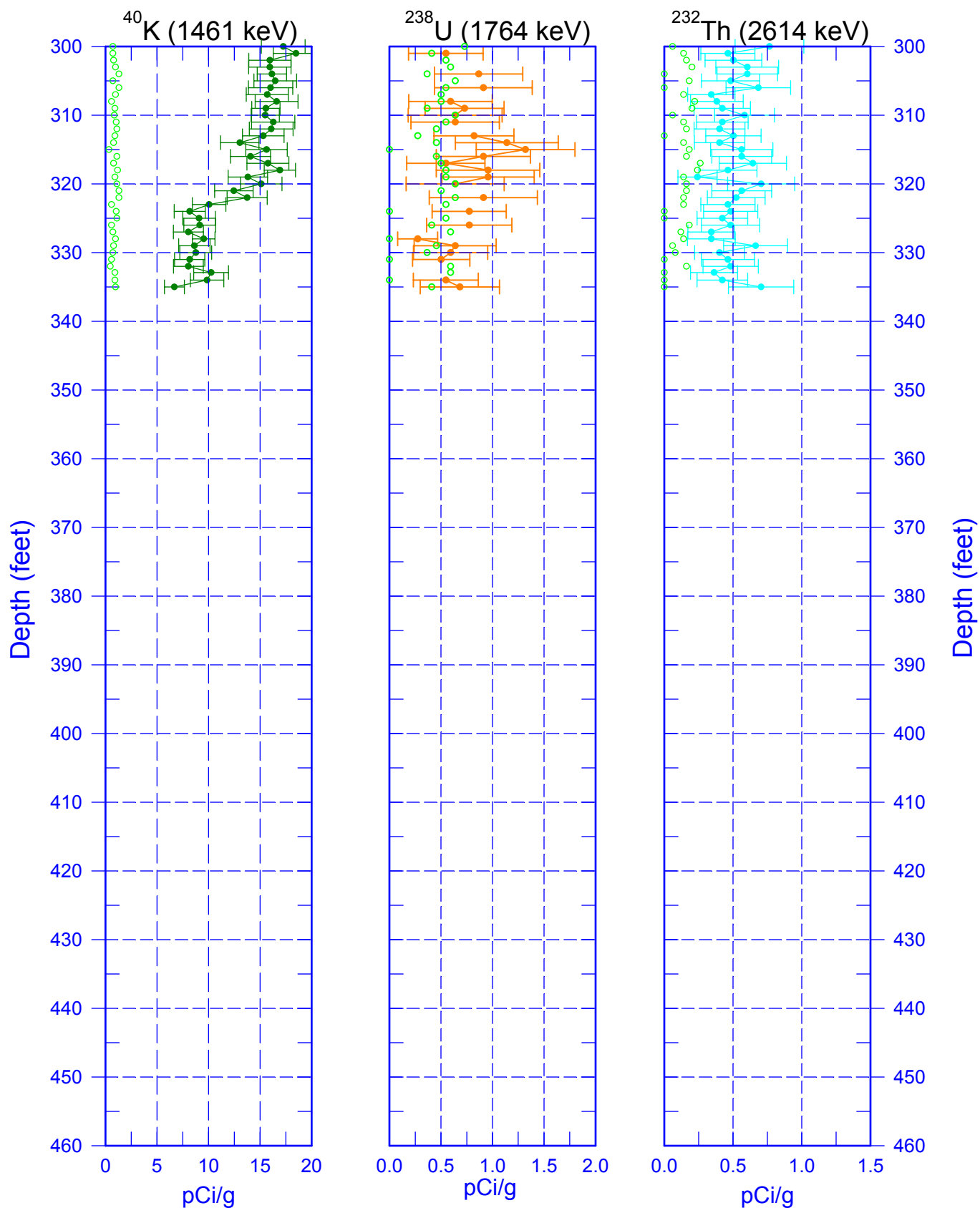
299-E17-05 (A4739)

Natural Gamma Logs



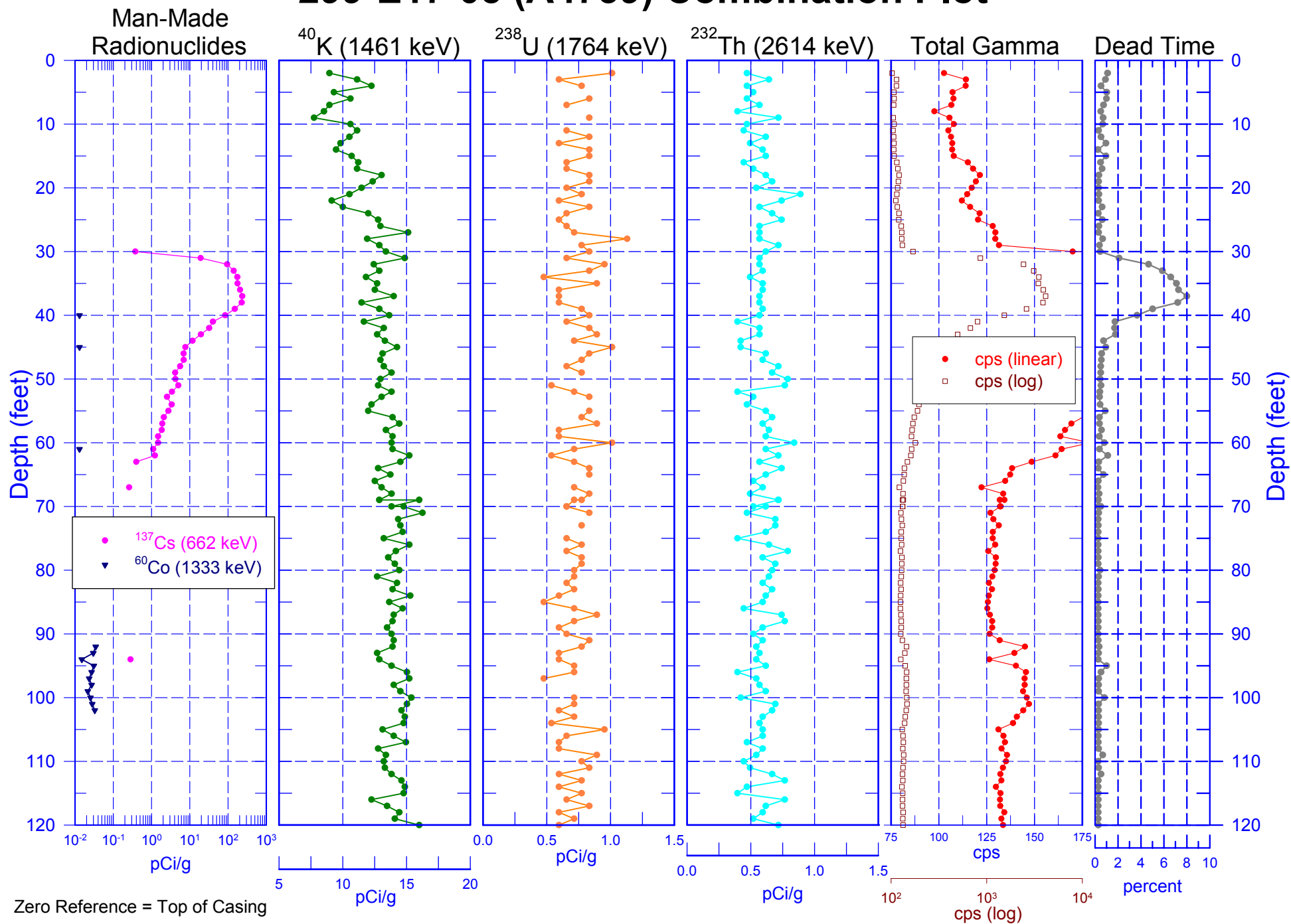
299-E17-05 (A4739)

Natural Gamma Logs

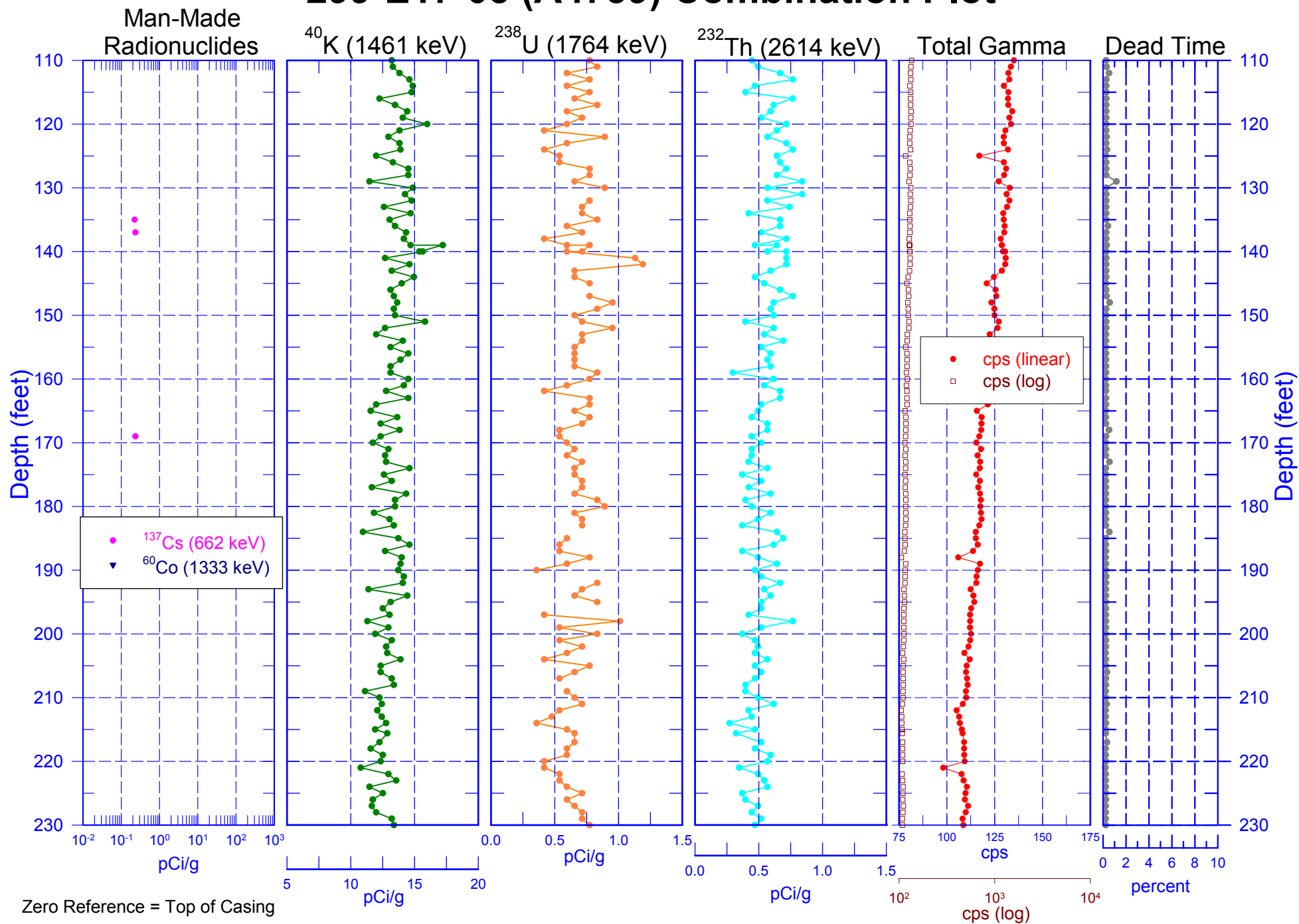


○ MDL

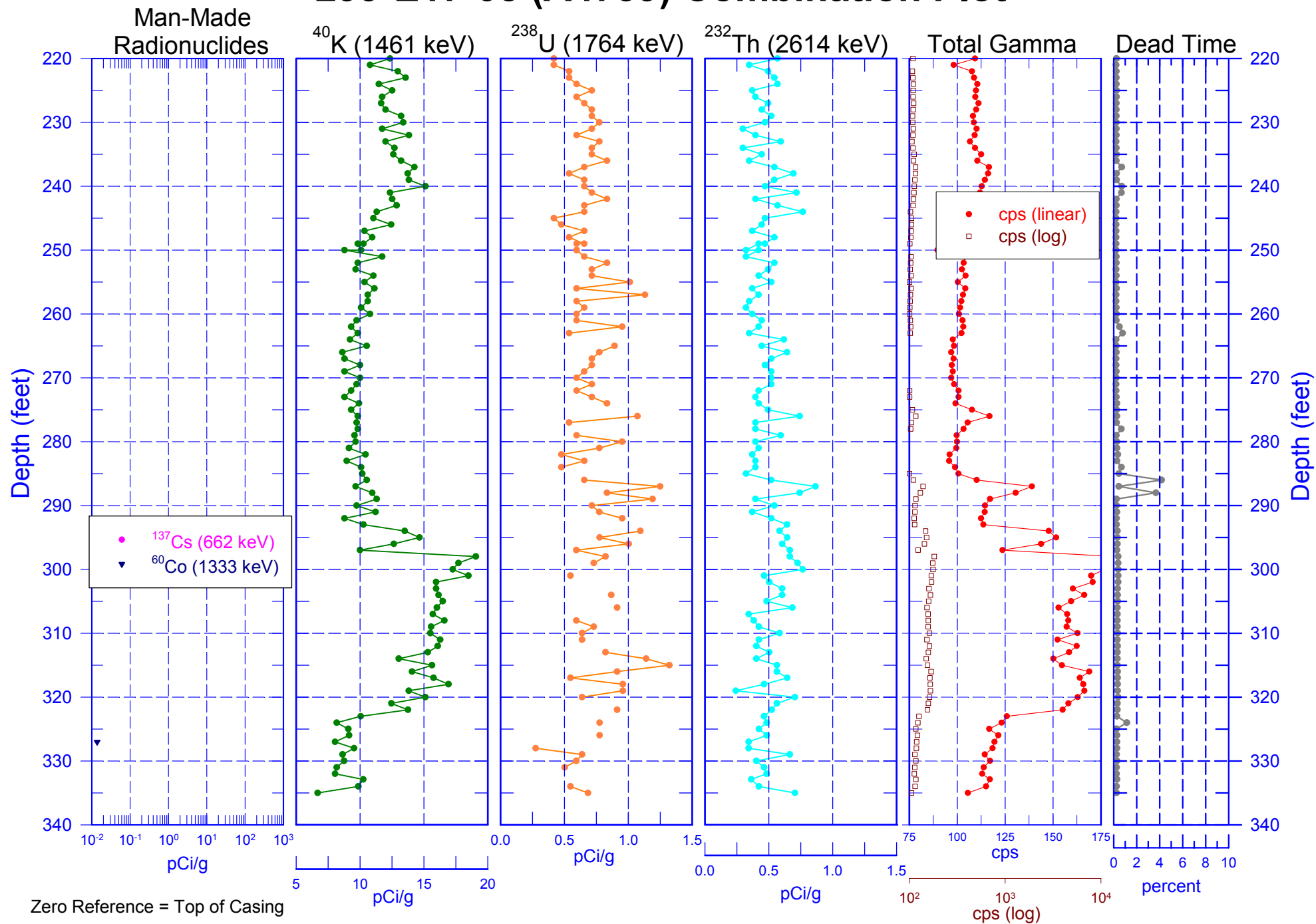
299-E17-05 (A4739) Combination Plot



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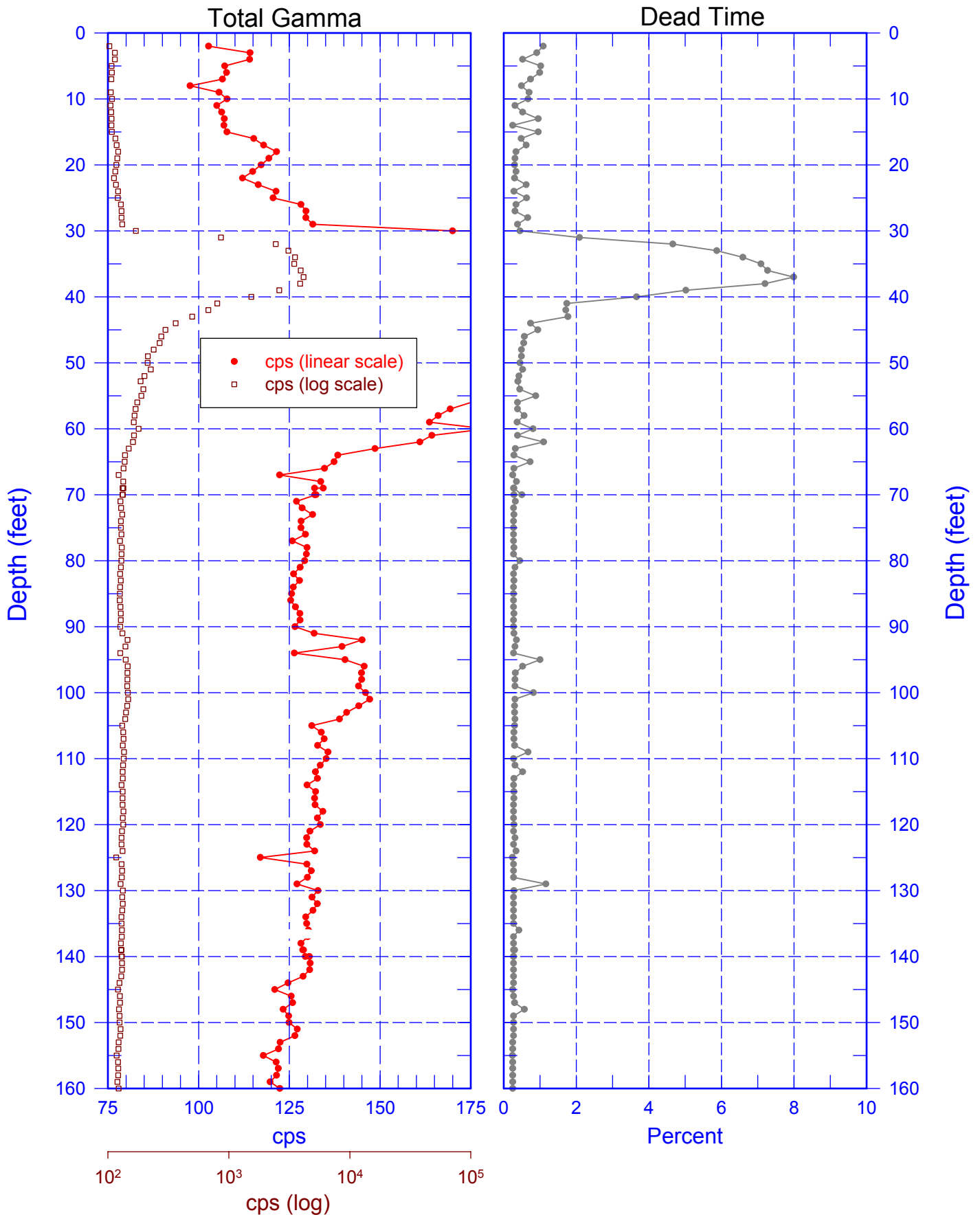


299-E17-05 (A4739) Combination Plot



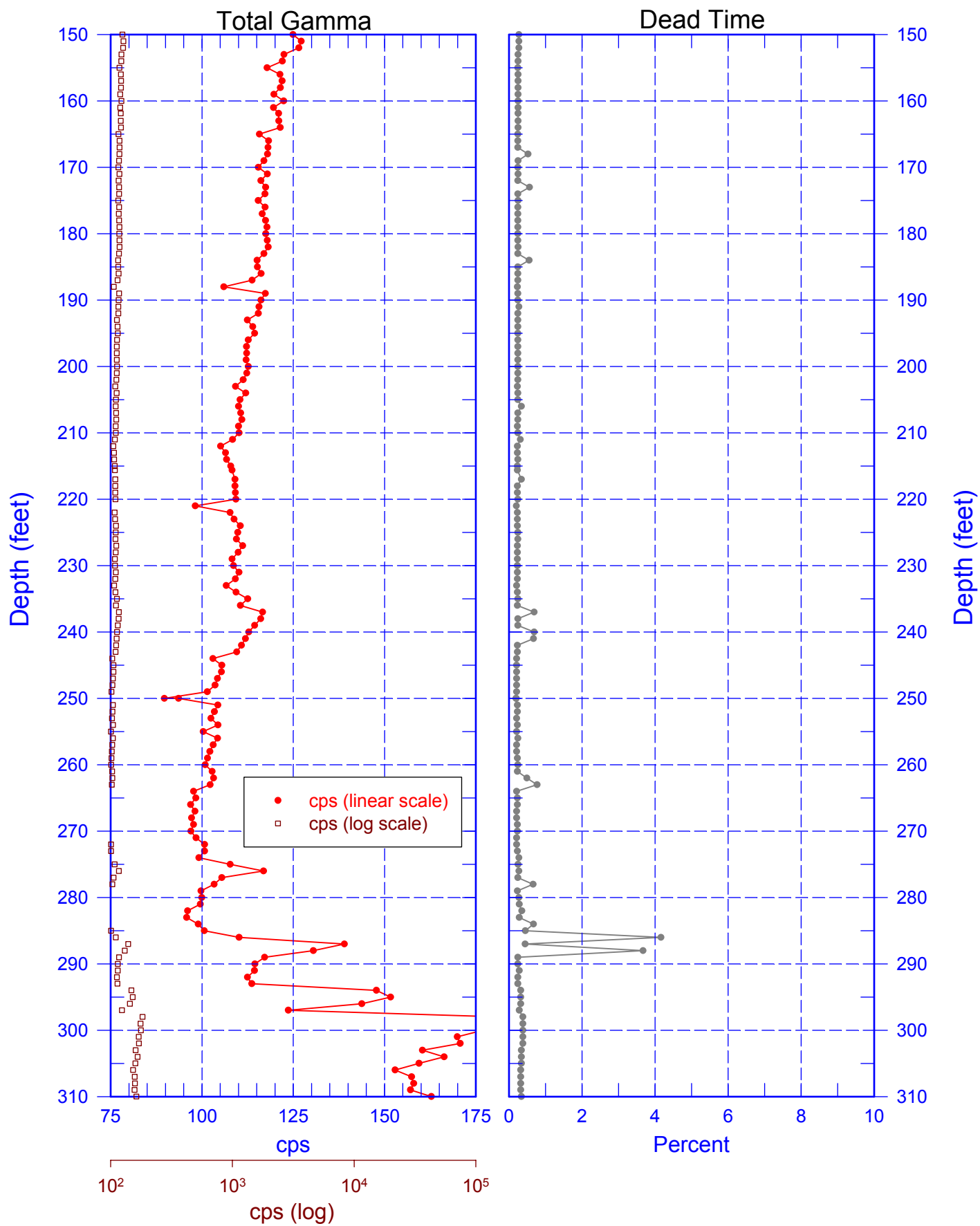
299-E17-05 (A4739)

Total Gamma & Dead Time



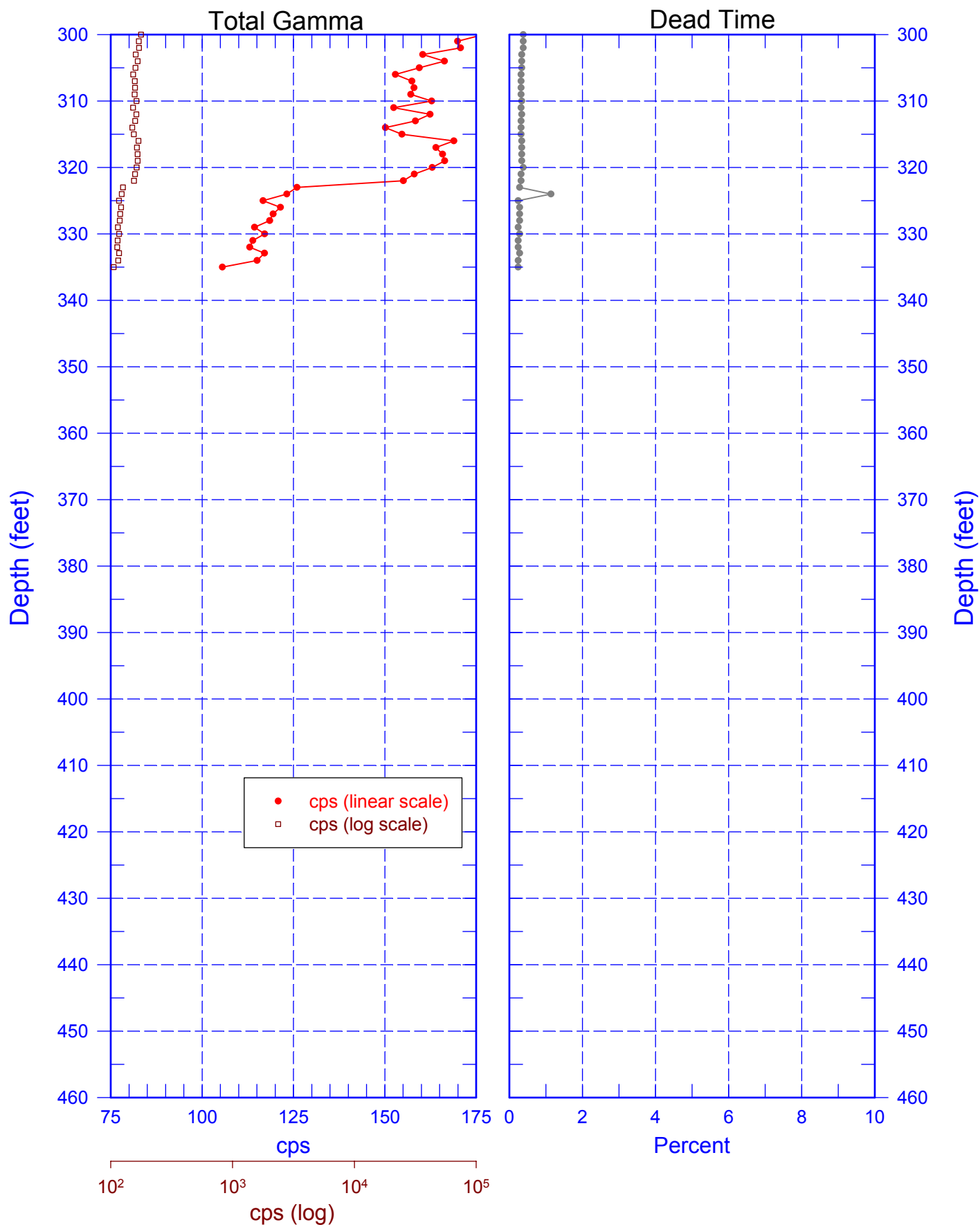
299-E17-05 (A4739)

Total Gamma & Dead Time



299-E17-05 (A4739)

Total Gamma & Dead Time



299-E17-05 (A4739)

Repeat Section of Natural Gamma Logs

